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AT 18:36:05 ON 13 DEC 2001
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COST IN U.S. DOLLARS	SINCE FILE ENTRY	TOTAL SESSION
FULL ESTIMATED COST	61.84	61.99

=> s plant and promoter

L5 26622 PLANT AND PROMOTER

=> s l5 and ferrodoxin? and RolD

L6 0 L5 AND FERRODOXIN? AND ROLD

=> s l5 and (chimeric or chimaeric)

L7 6479 L5 AND (CHIMERIC OR CHIMAERIC)

=> s l7 and (complementary)

L8 3629 L7 AND (COMPLEMENTARY)

=> s l7 and (complementary pattern)

L9 0 L7 AND (COMPLEMENTARY PATTERN)

=> s l7 and minimal

L10 2154 L7 AND MINIMAL

=> s l7 and (minimal same promoter)

L11 0 L7 AND (MINIMAL SAME PROMOTER)

=> d history

(FILE 'HOME' ENTERED AT 17:49:00 ON 13 DEC 2001)

FILE 'MEDLINE, CAPLUS, LIFESCI, EMBASE, USPATFULL' ENTERED AT 17:49:30
ON
13 DEC 2001
L1 21683 S (ERECTILE AND DYSFUNCTION) OR IMPOTENCE
L2 148 S L1 AND ENDOTHELIN
L3 21 S L2 AND APOMORPHINE
L4 19 DUP REM L3 (2 DUPLICATES REMOVED)
L5 26622 S PLANT AND PROMOTER
L6 0 S L5 AND FERRODOXIN? AND ROLD
L7 6479 S L5 AND (CHIMERIC OR CHIMAERIC)

L8 3629 S L7 AND (COMPLEMENTARY)
L9 0 S L7 AND (COMPLEMENTARY PATTERN)
L10 2154 S L7 AND MIN[redacted]L
L11 0 S L7 AND (MINIMAL SAME PROMOTER)

=> s l7 and arabidopsis

L12 1222 L7 AND ARABIDOPSIS

=> s l12 and (ferrodoxin or ferrodoxine)

L13 10 L12 AND (FERRODOXIN OR FERRODOXINE)

=> dup rem l13

PROCESSING COMPLETED FOR L13
L14 10 DUP REM L13 (0 DUPLICATES REMOVED)

=> d l14 ibib abs tot

L14 ANSWER 1 OF 10 USPATFULL
ACCESSION NUMBER: 2001:79356 USPATFULL
TITLE: Constructs and methods for enhancing protein levels in photosynthetic organisms
INVENTOR(S): Ko, Kenton, Kingston, Canada
Ko, Zdenka W., Kingston, Canada
Labate, Carlos A., Sao Paolo, Brazil
Granell, Antonio, Valencia, Spain
PATENT ASSIGNEE(S): Queen's University at Kingston, Kingston, Canada (non-U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 6239332	B1	20010529
APPLICATION INFO.:	US 1999-328153		19990608 (9)

RELATED APPLN. INFO.: Continuation-in-part of Ser. No. US 1996-759463, filed on 5 Dec 1996 Continuation-in-part of Ser. No. US 568168, now abandoned
DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Benzion, Gary
LEGAL REPRESENTATIVE: Pearlmutter, Nina L., Steeg, Carol Miernicki, Scribner, Stephen J.
NUMBER OF CLAIMS: 21
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 30 Drawing Figure(s); 18 Drawing Page(s)
LINE COUNT: 2398
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB This invention provides novel gene constructs which enhance the efficiency of **plant** cells and cells of other photosynthetic organisms. Also provided are transgenic plants and seeds which overexpress proteins. Methods to elevate the amount of plastid proteins in plants and photosynthetic organisms are exemplified.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L14 ANSWER 2 OF 10 USPATFULL
ACCESSION NUMBER: 2000:171124 USPATFULL
TITLE: Metal-regulated transporters and uses therefor
INVENTOR(S): Guerinot, Mary Lou, Etna, NH, United States
Eide, David J., Columbia, MO, United States
PATENT ASSIGNEE(S): Trustees of Dartmouth College, Hanover, NH, United States (U.S. corporation)
Regents of the University of Minnesota, Minneapolis,

MN, United States (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 6162900		20001219
APPLICATION INFO.:	US 1998-107858		19980630 (9)
RELATED APPLN. INFO.:	Division of Ser. No. US 1996-758621, filed on 27 Nov 1996, now patented, Pat. No. US 5846821		

	NUMBER	DATE
PRIORITY INFORMATION:	CA 1996-2187728	19961011
	US 1996-18578	19960529 (60)

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Bui, Phuong T.
LEGAL REPRESENTATIVE: Lahive & Cockfield, LLP
NUMBER OF CLAIMS: 4
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 37 Drawing Figure(s); 26 Drawing Page(s)
LINE COUNT: 4260
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Isolated nucleic acid molecules encoding novel members of the MRT family of polypeptides which include, in a preferred embodiment, at least one transmembrane domain having at least about 30%, more preferably at least about 50%, 55%, 60%, 70%, 80% or 90% amino acid sequence identity with SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:8 or SEQ ID NO:14 and/or at least one histidine rich domain, are described. The MRT polypeptides of the invention are capable of transporting metals such as Fe(II), Cd, Co, Mn, Pb, Hg and Zn. Transgenic plants in which expression of an MRT polypeptide of the invention is altered are also described. These transgenic plants can be used to remove pollutants from soil or as nutritional supplements to treat iron- or zinc-deficiency. Antisense nucleic acid molecules, recombinant expression vectors containing nucleic acid molecules of the invention, and host cells into which the expression vectors have been introduced are also described. The invention further provides isolated MRT polypeptides, fusion polypeptides and active fragments thereof. Therapeutic methods utilizing compositions of the invention are also provided.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L14 ANSWER 3 OF 10 USPATFULL
ACCESSION NUMBER: 2000:7392 USPATFULL
TITLE: Synthetic insecticidal crystal protein gene having a modified frequency of codon usage
INVENTOR(S): Adang, Michael J., Athens, GA, United States
Murray, Elizabeth E., Madison, WI, United States
PATENT ASSIGNEE(S): Mycogen Plant Science, Inc., San Diego, CA, United States (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 6015891		20000118
APPLICATION INFO.:	US 1996-705438		19960829 (8)
RELATED APPLN. INFO.:	Division of Ser. No. US 1995-369835, filed on 6 Jan 1995, now patented, Pat. No. US 5567600 which is a continuation-in-part of Ser. No. US 1993-57191, filed on 3 May 1993, now patented, Pat. No. US 5380831 which is a continuation of Ser. No. US 1992-827844, filed on

28 Jan 1992, now abandoned which is a continuation of Ser. No. US 1988-242482, filed on 9 Sep 1988, now abandoned

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Smith, Lynette R. F.
ASSISTANT EXAMINER: Nelson, Amy J.
LEGAL REPRESENTATIVE: Saliwanchik, Lloyd & Saliwanchik
NUMBER OF CLAIMS: 6
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 3 Drawing Figure(s); 5 Drawing Page(s)
LINE COUNT: 1919
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Synthetic Baccilus thuringiensis toxin genes designed to be expressed in plants at a level higher than naturally-occurring Bt genes are provided.

These genes utilize codons preferred in highly expressed monocot or dicot proteins.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L14 ANSWER 4 OF 10 USPATFULL

ACCESSION NUMBER: 2000:4686 USPATFULL
TITLE: Transgenic plants comprising a synthetic insecticidal crystal protein gene having a modified frequency of codon usage
INVENTOR(S): Adang, Michael J., Madison, WI, United States
Murray, Elizabeth E., Madison, WI, United States
PATENT ASSIGNEE(S): Mycogen Plant Science, Inc., San Diego, CA, United States (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 6013523		20000111
APPLICATION INFO.:	US 1996-704966		19960829 (8)

RELATED APPLN. INFO.: Division of Ser. No. US 1995-369839, filed on 6 Jan 1995, now patented, Pat. No. US 5567862 which is a division of Ser. No. US 1993-57191, filed on 3 May 1993, now patented, Pat. No. US 5380831 which is a continuation of Ser. No. US 1992-827844, filed on 28 Jan 1992, now abandoned which is a continuation of Ser. No. US 1988-242482, filed on 9 Sep 1988, now abandoned

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Smith, Lynette R. F.
ASSISTANT EXAMINER: Nelson, Amy J.
LEGAL REPRESENTATIVE: Saliwanchik, Lloyd & Saliwanchik
NUMBER OF CLAIMS: 4
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 3 Drawing Figure(s); 5 Drawing Page(s)
LINE COUNT: 1886
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Synthetic Baccilus thuringiensis toxin genes designed to be expressed in plants at a level higher than naturally-occurring Bt genes are provided.

These genes utilize codons preferred in highly expressed monocot or dicot proteins.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L14 ANSWER 5 OF 10 USPATFULL

ACCESSION NUMBER: 2000:2040 USPATFULL
TITLE: Constructs and methods for enhancing protein levels in

photosynthetic organisms
INVENTOR(S): Ko, Kenton, Kingston, Canada
Ko, [redacted]nka W., Kingston, Canada
Labate, Carlos A., Piracicaba, Brazil
Granell, Antonio, Alginet, Spain
PATENT ASSIGNEE(S): Queen's University at Kingston, Kingston, Canada (non-U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 6011198		20000104
APPLICATION INFO.:	US 1996-759463		19961205 (8)

RELATED APPLN. INFO.: Continuation-in-part of Ser. No. US 1995-568168, filed on 6 Dec 1995
DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Robinson, Douglas W.
ASSISTANT EXAMINER: Haas, Thomas
LEGAL REPRESENTATIVE: Hamilton, Brook, Smith & Reynolds, P.C.
NUMBER OF CLAIMS: 40
EXEMPLARY CLAIM: 23
NUMBER OF DRAWINGS: 26 Drawing Figure(s); 16 Drawing Page(s)
LINE COUNT: 2206
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB This invention provides novel gene constructs which enhance the efficiency of **plant** cells and cells of other photosynthetic organisms. Also provided are transgenic plants and seeds which overexpress proteins. Methods to elevate the amount of plastid proteins in plants and photosynthetic organisms are exemplified.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L14 ANSWER 6 OF 10 USPATFULL
ACCESSION NUMBER: 1998:154133 USPATFULL
TITLE: Metal-regulated transporters and uses therefor
INVENTOR(S): Guerinot, Mary Lou, Etna, NH, United States
Eide, David J., Columbia, MS, United States
PATENT ASSIGNEE(S): Trustees of Dartmouth College, Hanover, NH, United States (U.S. corporation)
Regents of the University of Minnesota, Minneapolis, MN, United States (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 5846821		19981208
APPLICATION INFO.:	US 1996-758621		19961127 (8)

	NUMBER	DATE
PRIORITY INFORMATION:	US 1996-18578	19960529 (60)

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Marschel, Ardin H.
LEGAL REPRESENTATIVE: Loren, Esq., Ralph A.Lahive & Cockfield, LLP
NUMBER OF CLAIMS: 24
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 35 Drawing Figure(s); 26 Drawing Page(s)
LINE COUNT: 4077
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Isolated nucleic acid molecules encoding novel members of the MRT family of polypeptides which include, in a preferred embodiment, at least one transmembrane domain having at least about 30%, more preferably at least about 50%, 55%, 60%, 70%, 80% or 90% amino acid sequence identity with SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:8 or SEQ ID NO:14

and/or at least one histidine rich domain, are described. The MRT polypeptides of the invention are capable of transporting metals such as Fe(II), Cd, Co, Mn, Pb, Hg and Zn. Transgenic plants in which expression of an MRT polypeptide of the invention is altered are also described. These transgenic plants can be used to remove pollutants from soil or as nutritional supplements to treat iron- or zinc-deficiency. Antisense nucleic acid molecules, recombinant expression vectors containing nucleic acid molecules of the invention, and host cells into which the expression vectors have been introduced are also described. The invention further provides isolated MRT polypeptides, fusion polypeptides and active fragments thereof. Therapeutic methods utilizing compositions of the invention are also provided.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L14 ANSWER 7 OF 10 USPATFULL

ACCESSION NUMBER:	96:97196 USPATFULL
TITLE:	Synthetic insecticidal crystal protein gene
INVENTOR(S):	Adang, Michael J., Madison, WI, United States Rocheleau, Thomas A., Madison, WI, United States Merlo, Donald J., Madison, WI, United States Murray, Elizabeth E., Madison, WI, United States
PATENT ASSIGNEE(S):	Mycogen Plant Sciences, Inc., San Diego, CA, United States (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 5567862		19961022
APPLICATION INFO.:	US 1995-369839		19950106 (8)
RELATED APPLN. INFO.:	Division of Ser. No. US 1993-57191, filed on 3 May 1993, now patented, Pat. No. US 5380831 which is a continuation of Ser. No. US 1992-827844, filed on 28 Jan 1992, now abandoned which is a continuation-in-part of Ser. No. US 1988-242482, filed on 9 Sep 1988, now abandoned which is a continuation-in-part of Ser. No. US 1986-848733, filed on 4 Apr 1986, now abandoned which is a continuation-in-part of Ser. No. US 1983-535354, filed on 24 Sep 1983, now abandoned		
DOCUMENT TYPE:	Utility		
FILE SEGMENT:	Granted		
PRIMARY EXAMINER:	Chereskin, Che S.		
LEGAL REPRESENTATIVE:	Saliwanchik & Saliwanchik		
NUMBER OF CLAIMS:	24		
EXEMPLARY CLAIM:	1,13		
NUMBER OF DRAWINGS:	5 Drawing Figure(s); 5 Drawing Page(s)		
LINE COUNT:	1714		

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Synthetic Bacillus thuringiensis toxin genes designed to be expressed in plants at a level higher than naturally-occurring Bt genes are provided. These genes utilize codons preferred in highly expressed monocot or dicot proteins.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L14 ANSWER 8 OF 10 USPATFULL

ACCESSION NUMBER:	96:96940 USPATFULL
TITLE:	Synthetic insecticidal crystal protein gene
INVENTOR(S):	Adang, Michael J., Athens, GA, United States Rocheleau, Thomas A., Madison, WI, United States

Merlo, Donald J., Carmel, IN, United States
Murray, Elizabeth E., Madison, WI, United States
PATENT ASSIGNEE(S): Mycogen Plant Sciences, Inc., San Diego, CA, United States (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 5567600		19961022
APPLICATION INFO.:	US 1995-369835		19950106 (8)

RELATED APPLN. INFO.: Continuation-in-part of Ser. No. US 1993-57191, filed on 3 May 1993, now patented, Pat. No. US 5380831 which is a continuation of Ser. No. US 1992-827844, filed on 28 Jan 1992, now abandoned which is a continuation of Ser. No. US 1988-242482, filed on 9 Sep 1988, now abandoned which is a continuation-in-part of Ser. No. US 1986-848733, filed on 4 Apr 1986, now abandoned which is a continuation-in-part of Ser. No. US 1983-535354, filed on 24 Sep 1983, now abandoned
DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Chereskin, Che S.
LEGAL REPRESENTATIVE: Saliwanchik & Saliwanchik
NUMBER OF CLAIMS: 24
EXEMPLARY CLAIM: 1,13
NUMBER OF DRAWINGS: 5 Drawing Figure(s); 5 Drawing Page(s)
LINE COUNT: 1723
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Synthetic Baccilus thuringiensis toxin genes designed to be expressed in plants at a level higher than naturally-occurring Bt genes are provided.

These genes utilize codons preferred in highly expressed monocot or dicot proteins.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L14 ANSWER 9 OF 10 USPATFULL
ACCESSION NUMBER: 95:3946 USPATFULL
TITLE: Synthetic insecticidal crystal protein gene
INVENTOR(S): Adang, Michael J., Madison, WI, United States
Rocheleau, Thomas A., Madison, WI, United States
Merlo, Donald J., Madison, WI, United States
Murray, Elizabeth E., Madison, WI, United States
PATENT ASSIGNEE(S): Mycogen Plant Science, Inc., San Diego, CA, United States (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 5380831		19950110
APPLICATION INFO.:	US 1993-57191		19930503 (8)

RELATED APPLN. INFO.: Continuation of Ser. No. US 1992-827844, filed on 28 Jan 1992, now abandoned which is a continuation of Ser. No. US 1988-242482, filed on 9 Sep 1988, now abandoned which is a continuation-in-part of Ser. No. US 1986-848733, filed on 4 Apr 1986, now abandoned which is a continuation-in-part of Ser. No. US 1993-535354, filed on 26 Sep 1993, now abandoned
DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Chereskin, Che S.
LEGAL REPRESENTATIVE: Saliwanchik & Saliwanchik
NUMBER OF CLAIMS: 14
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 3 Drawing Figure(s); 5 Drawing Page(s)
LINE COUNT: 1573

CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB Synthetic Bacillus thuringiensis toxin genes designed to be expressed in
plants at a level higher than naturally-occurring Bt genes are provided.
These genes utilize codons preferred in highly expressed monocot or dicot proteins.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L14 ANSWER 10 OF 10 USPATFULL

ACCESSION NUMBER:	93:40119 USPATFULL
TITLE:	Expression of herbicide metabolizing cytochromes
INVENTOR(S):	Dean, Caroline, Norwich, United Kingdom Harder, Patricia A., Wilmington, DE, United States Leto, Kenneth J., Wilmington, DE, United States O'Keefe, Daniel P., Ridley Park, PA, United States Omer, Charles A., Downingtown, PA, United States Romesser, James A., Wilmington, DE, United States Tepperman, James M., Oakland, CA, United States
PATENT ASSIGNEE(S):	E. I. Du Pont de Nemours and Company, Wilmington, DE, United States (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 5212296		19930518
APPLICATION INFO.:	US 1990-569781		19900823 (7)
RELATED APPLN. INFO.:	Continuation-in-part of Ser. No. US 1990-464499, filed on 12 Jan 1990, now abandoned which is a continuation-in-part of Ser. No. US 1989-405605, filed on 11 Sep 1989, now abandoned		
DOCUMENT TYPE:	Utility		
FILE SEGMENT:	Granted		
PRIMARY EXAMINER:	Chereskin, Che S.		
NUMBER OF CLAIMS:	14		
EXEMPLARY CLAIM:	1		
NUMBER OF DRAWINGS:	58 Drawing Figure(s); 45 Drawing Page(s)		
LINE COUNT:	3437		

CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB DNA sequences encoding herbicide metabolizing cytochrome P450 enzymes and iron-sulfur proteins that donate electrons to these enzymes, were introduced into plants and microorganisms rendering them able to produce
the encoded gene products and to metabolize herbicides.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

=> d ibib kwic 1

L14 ANSWER 1 OF 10 USPATFULL

ACCESSION NUMBER:	2001:79356 USPATFULL
TITLE:	Constructs and methods for enhancing protein levels in photosynthetic organisms
INVENTOR(S):	Ko, Kenton, Kingston, Canada Ko, Zdenka W., Kingston, Canada Labate, Carlos A., Sao Paolo, Brazil Granell, Antonio, Valencia, Spain
PATENT ASSIGNEE(S):	Queen's University at Kingston, Kingston, Canada (non-U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 6239332	B1	20010529
APPLICATION INFO.:	US 1999-328153		19990608 (9)

RELATED APPLN. INFO.: Continuation-in-part of Ser. No. US 1996-759463, filed on 5 Dec 1996 Continuation-in-part of Ser. No. US 5681[redacted] now abandoned
DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Benzion, Gary
LEGAL REPRESENTATIVE: Pearlmutter, Nina L., Steeg, Carol Miernicki, Scribner, Stephen J.
NUMBER OF CLAIMS: 21
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 30 Drawing Figure(s); 18 Drawing Page(s)
LINE COUNT: 2398
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB This invention provides novel gene constructs which enhance the efficiency of **plant** cells and cells of other photosynthetic organisms. Also provided are transgenic plants and seeds which overexpress proteins. Methods to elevate. . .

SUMM **Plant** productivity is limited by the amount of resources available and the ability of plants to harness these resources. The conversion. . . a complex system which combines the light harvesting apparatus of pigments and proteins. The value of light energy to the **plant** can only be realized when it is efficiently converted into chemical energy by photosynthesis and fed into various biochemical processes.

SUMM . . . compensating response to low irradiance, balancing light harvesting and CO.sub.2 fixation (Evans, J. R. (1989) Oecologia 78:9); Stitt, M. (1991) **Plant**, Cell and Environment 14:741).

SUMM . . . reorganization of the light harvesting complexes (Chow et al. (1990) Proc. Natl. Acad. Sci. USA 87:7502; Horton et al. (1994) **Plant** Physiol. 106:415; Melis, (1991) Biochim. Biophys. Acta. 1058:87). A **plant**'s reorganizational ability to compensate for changes in the characteristics of the light limits its productivity. Although a mechanism is in. . .

SUMM If productivity of a **plant** or other photosynthetic organism is to be increased, methods to enhance the light-gathering capacity without restricting CO.sub.2 fixation must be. . .

SUMM The present invention provides a **chimeric** gene construct comprising a **promoter** region, a 5' untranslated region containing a translational enhancer, DNA encoding a plastid-specific transit peptide which enhances protein import, a. . .

SUMM In one embodiment of the present invention the **promoter** is a 35S cauliflower mosaic virus (CaMV) **promoter**. In another embodiment, the translational enhancer is from the 5' untranslated region of the pea small subunit of ribulose-1,5-bisphosphate carboxylase.. . .

SUMM This invention also provides a method for enhancing the light harvesting capability of a photosynthetic **plant** or organism comprising: preparing a gene construct comprising a **promoter**, a 5' untranslated region containing a translational enhancer, DNA encoding a plastid-specific transit peptide which enhances protein import, DNA encoding. . . untranslated region containing a functional polyadenylation signal; inserting the gene construct into a suitable cloning vector; and transforming a photosynthetic **plant** or other photosynthetic organism with the recombinant vector. Alternatively, the gene construct is coated directly on biolistic particles with which. . .

SUMM . . . or in the cells of photosynthetic prokaryotes. These constructs can alter the photosynthetic apparatus to increase the ability of the **plant** to harvest light, especially under conditions of low illumination.

SUMM . . . the commercial value of plants and seeds, and be used to increase the yields of products produced from fermentation and

plant tissue culture operations.

SUMM This invention also provides a transgenic (TR) **plant** or photosynthetic organism containing the construct described above. These transgenic plants and photosynthetic organisms have enhanced photosynthetic capacity and enhanced. . . increased ability to withstand transplant shock. Seeds produced from these plants are also provided by this invention, as well as **plant** parts useful for production of regenerated plants and other derived products.

DRWD . . . 14A-14D are a set of four histograms showing the the best-performing canola line (`20-2-S3`) against wild type (var. `Quantum`) for **plant** height at maturity (FIG. 14A), average pod length (FIG. 14B), total seed yield per **plant** (FIG. 14C), and average seed size (FIG. 14D).

DETD This invention relates to a DNA construct which, when incorporated into a **plant** or cell of a photosynthetic organism, increases the efficiency of plastids or a photosynthetic cell, and to methods for increasing. . . products of plastid metabolism via enhancement of protein expression and import. The present invention also relates to transgenic plants, seeds, **plant** cells and tissues, and other photosynthetic organisms incorporating these constructs.

DETD A DNA construct of this invention comprises a **promoter**, a 5' untranslated region containing a translational enhancer, DNA encoding a plastid-specific transit peptide which can enhance and direct import.

. the 5' to 3' direction of transcription. A preferred embodiment of the invention is a construct comprising a 5' constitutive **promoter** (such as the 35S cauliflower mosaic virus **promoter**), the 5' untranslated region of pea small subunit of ribulose-1,5-bisphosphate carboxylase containing a translational enhancer which has a nucleotide sequence. . .

DETD To produce the **chimeric** constructs provided in this invention, an effective **chimeric** Rbcs-Cab coding region was created by combining coding sequences for appropriate portions of Rbcs and type I LhcIIb Cab. Transgenic. . . at the level of de novo transcription was facilitated by attaching the Rbcs-Cab gene construct to the strong CaMV 35S **promoter**. Further enhancements were obtained by increasing mRNA stability, thus increasing the magnitude of the steady state pool of transgene transcripts.. . .

DETD The term "**promoter**" or "**promoter** region" refers to a sequence of DNA, usually upstream (5') to the coding region of a structural gene, which controls. . .

DETD An inducible **promoter** is a **promoter** that is capable of directly or indirectly activating transcription of one or more DNA sequences or genes in response to. . . DNA sequences or genes will not be transcribed. Typically a protein factor (or factors), that binds specifically to an inducible **promoter** to activate transcription, is present in an inactive form which is then directly or indirectly converted to an active form. . . an illumination agent such as light, darkness and light's various aspects, which include wavelength, intensity, fluence, direction and duration. A **plant** cell containing an inducible **promoter** may be exposed to an inducer by externally applying the inducer to the cell or **plant** such as by spraying, watering, heating or similar methods. If it is desirable to activate the expression of a gene at a particular time during **plant** development, the inducer can be applied at that time.

DETD Examples of such inducible promoters include heat shock promoters, such as the inducible hsp70 heat shock **promoter** of Drosphilia melanogaster (Freeling, M. et al. (1985) Ann. Rev. of Genetics 19:297-323); a cold inducible **promoter**, such as the cold inducible **promoter** from B. napus (White, T. C. et al. (1994 **Plant** Physiol. 106:917); and the alcohol dehydrogenase **promoter** which is induced by ethanol (Nagao, R. T. et al., Miflin, B. J., Ed. Oxford Surveys of **Plant** Molecular and Cell Biology, Vol. 3, p 384-438, Oxford University Press, Oxford 1986).

DETD . . . as the 35S and 19S regions of cauliflower mosaic virus (CaMV) (Brisson et al. (1984) Nature 310:511-514), or the coat **promoter** of TMV (Takamatsu et [redacted] (1987) EMBO J. 6:307-311).

DETD Other useful **plant** promoters include promoters which are highly expressed in phloem and vascular tissue of plants such as the glutamine synthase **promoter** (Edwards et al. (1990) Proc. Natl. Acad. Sci. USA 87:3459-3463), the maize sucrose synthetase 1 **promoter** (Yang et al. (1990) Proc. Natl. Acad. Sci. USA 87:4144-4148), the **promoter** from the Rol-C gene of the TLDNA of Ri plasmid (Sagaya et al., **Plant** Cell Physiol., 3:649-653), and the phloem-specific region of the pRVC-S-3A **promoter** (Aoyagi et al., Mol. Gen. Genet., 213:179-185 (1988)). Alternatively, **plant** promoters such as the small subunit of Rubisco (Rbcs) **promoter** (Coruzzi et al., EMBO J., 3:1671-1679 (1984); Broglie et al., Science, 224:838-843 (1984)), or heat shock promoters, e.g., soybean HPS17.5-E. . .

DETD Other useful promoters which can be used according to the present invention include: the low temperature and ABA-responsive **promoter** Kin1, cor6.6 (Wang et al. (1995) **Plant** Mol. Biol. 28:605; Wang and Cutler (1995) **Plant** Mol. Biol. 28:619); the ABA inducible **promoter** from EM gene wheat (Marcotte Jr. et al. (1989) **Plant** Cell 1:969); the phloem-specific sucrose synthase **promoter**, ASUS1, from **Arabidopsis** (Martin et al. (1993) **Plant** J. 4:367); the root and shoot **promoter**, ACS1 (Rodrigues-Pousada et al. (1993) **Plant** Cell 5:897); the seed-specific 22 kDa zein protein **promoter** from maize (Unger et al. (1993) **Plant** Cell 5:831); the ps1 lectin **promoter** in pea (de Pater et al. (1993) **Plant** Cell 5:877); the phas **promoter** from Phaseolus vulgaris (Frisch et al. (1995) **Plant** J. 7:503); the late embryo-abundant lea **promoter** (Thomas, T. L. (1993) **Plant** Cell 5:1401); the fruit-specific E8 gene **promoter** from tomato (Cordes et al. (1989) **Plant** Cell 1:1025); the meristematic tissue-specific PCNA **promoter** (Kosugi et al. (1995) **Plant** J. 7:877); the NTP303 pollen-specific **promoter** (Weterings et al. (1995) **Plant** J. 8:55); the late embryogenesis stage-specific OSEM **promoter** (Hattori et al. (1995) **Plant** J. 7:913); the ADP-glucose pyrophosphorylase tissue-specific **promoter** for guard cells and tuber parenchyma cells (Muller-Rober et al. (1994) **Plant** Cell 6:601); the Myb conductive tissue-specific **promoter** (Wissenbach et al.(1993) **Plant** J. 4:411); and the plastocyanin **promoter** from **Arabidopsis** (Vorst et al. (1993) **Plant** J. 4:933).

DETD . . . the source of the transcriptional initiation region, or from the structural gene. This sequence can also be derived from the **promoter** selected to express the gene, and can be specifically modified so as to increase translation of the mRNA.

DETD . . . nucleic acid sequences demonstrating translational enhancing activity have been reported for leader or 5' untranslated sequences such as from the **ferrodoxin**-binding protein gene psaDb (Yamamoto et al. (1995) J. Biol Chem. 270:12466), ferredoxin (Dickey et al. (1994) **Plant** Cell 6:1171), the 68 base leader from tobacco mosaic virus (TMV) (Gallie et al. (1987) Nucleic Acids Res. 15:3257) and. . . other genes and their corresponding transcripts and can vary in strength and efficiency (see review by Gallie. 1993 Ann. Rev. **Plant** Physiol. **Plant** Mol. Biol. 44, 77). Such nucleic acid sequences, if demonstrated to contain translational enhancing effects, can also be used in. . .

DETD . . . to a peptide which is capable of directing intracellular transport of a protein joined thereto to a plastid in a **plant** host cell. The passenger protein may be homologous or heterologous with respect to the transit peptide. Chloroplasts are the primary plastids in photosynthetic tissues, although **plant** cells are likely to

have other kinds of plastids, including amyloplasts, chromoplasts, and leucoplasts. The transit peptide of the present. .

DETD In all **plant** species examined to date, chlorophyll a/b binding proteins of LhcII are encoded by a multi-gene family, comprising at least five genes in **Arabidopsis**, six genes in Nicotiana tabacum, eight genes in N. plumbaginifolia, and up to 15 genes in tomato

(Jansson, S. et al. (1992) **Plant** Mol. Biol. Rep. 10:242-253). Thus, any of these genes would be a suitable target for increasing the amount of chlorophyll. . .

DETD . . . more pigment-binding proteins. Such polyproteins, which are cleaved to produce mature proteins, are described in Enomoto, T., et al.

(1997) **Plant** Cell Physiol. 38(6):743-746. The polyprotein can consist of all identical parts or of heterologous parts. For example, the DNA encoding. . .

DETD . . . 84,8844.

Jansson & Gustafsson, 1991. Mol. Gen. Genet. 229,67.
Palomares et al. 1991, J Photochem. Photobiol. B: Biol. 11,151.
Ikeuchi et al. 1991, **Plant** Cell Physiol. 32, 103.
Knoetzel et al. 1992, Eur. J Biochem 206, 209.
Stayton et al. 1987, **Plant** Mol. Biol. 10,127.
Pichersky et al. 1988, **Plant** Mol. Biol. 11, 69.
Pichersky et al. 1989, **Plant** Mol. Biol. 12,257.
Schwartz et al. 1991a, FEBS Lett. 280,229.
Zhang et al. 1991, **Plant** Physiol 96,1387.
Chitnis and Thornber, 1988, **Plant** Mol. Biol. 11,95.
Jansson et al. 1990, Biochim. Biophys. Acta. 1019, 110.
Green et al. 1992, FEBS Lett. 305, 18.
Schwartz et al. 1991b, **Plant** Mol. Biol. 17, 923.
Brandt et al. 1992, **Plant** Mol. Biol. 19, 699.
Bassi & Dainese, 1990, In: Current Research in Photosynthesis. Vol II, Baltscheffsky, M. (ed.) pp 209-216.
Morishige & Thornber, 1990, FEBS Lett. 293:183.
Bassi & Dainese, 1992, In: Regulation of chloroplast biogenesis. Argyroudi-Akoyonoglou, J. (ed.), pp. 511-520.
Morishige & Thornber, 1992, **Plant** Physiol. 98, 238.
Henrysson et al. 1989, Biochim. Biophys. Acta. 977, 301.
Pichersky et al. 1991., Mol. Gen. Genet. 227,277.
Sorensen et al. 1992, **Plant** Physiol. 98, 1538.
Schwartz & Pichersky, 1990. **Plant** Mol. Biol. 15, 157
Morishige et al. 1990. FEBS Lett. 264, 239
Spangfort et al. 1990. In: Current Research in Photosynthesis. Vol II,. . .

DETD . . . PSII, there is a very high sequence homology between type I and

type II Cab proteins (Pichersky et al. (1989) **Plant** Mol. Biol. 12:257). Thus, targeting this gene will significantly alter the chlorophyll content.

DETD . . . Acad. Sci. USA 84:8844); Lhca2; Lhca3 type III, the major Cab proteins of PSI, e.g. Lhca3*1 (Pichersky et al. (1989) **Plant** Mol. Biol. 12:257); Lhca4; and

DETD . . . II--complexes of photosystem II, such as Lhcb1; Lhcb2 type II, the major Cab proteins, e.g. Lhcb2*1 (Pichersky et al. (1987) **Plant** Mol. Biol. 9:109); Lhcb3 type III, the major Cab proteins, e.g. Lhcb3*1 (Schwartz et al. (1991) FEBS Lett. 280:229); Lhcb4;. . .

DETD . . . in transgenic plants which grow well in high light intensities.

The insertion of a chlorophyll-binding protein derived from a shade-tolerant **plant** into a high-light requiring **plant**, such as maize or tomato, can result in a pigment level and proportion which produces a unique shade-tolerant variety of. . .

DETD . . . regions containing a polyadenylation signal of Agrobacterium tumor inducing (Ti) plasmid genes, such as the nopaline synthase (Nos gene) and **plant** genes such as the soybean storage protein genes and the gene for the small subunit of ribulose-1,5-bisphosphate

carboxylase. Other suitable. . . well as from other organisms such as animals if they are d[redacted]ed appropriately functional in[redacted]e environment of a transgenic **plant** cell or cell of a photosynthetic organism. In one embodiment of the invention, the 3' untranslated region is derived from. . .

DETD To aid in identification of transformed **plant** cells, the constructs of this invention may be further manipulated to include genes coding for **plant** selectable markers. Useful selectable markers include enzymes which provide for resistance to an antibiotic such as gentamycin, hygromycin, kanamycin, or. . .

DETD The constructs of the present invention can be introduced into **plant** cells through infection with viruses or bacteria or direct introduction by physical or chemical means. Examples of indirect (infection) and direct methods include Ti plasmids, Ri plasmids, **plant** virus vectors, micro-injection, microprojectiles, electroporation, and the like. For reviews of such techniques see, e.g., Weissbach and Weissbach, Methods for **Plant** Molecular Biology, Academic Press, New York, Section VIII, pp. 421-463 (1988); and Grierson and Corey, **Plant** Molecular Biology, 2d Ed., Blackie, London, Ch. 7-9 (1988)). The term "transformation" as used herein, refers to the insertion of a construct into a **plant** cell or the cell of a photosynthetic organism by any of the above methods.

DETD Methods of regenerating whole plants from **plant** cells are known in the art (See, e.g., **Plant** Molecular Biology Manual, (Eds. S. B. Gelvin, R. A. Schilperoort) Kluwer Acad. Publishers (1988), and the method of obtaining transformed and regenerated plants is not critical to this invention. In general, transformed **plant** cells are cultured in an appropriate medium, which may contain selective agents such as antibiotics, where selectable markers are used to facilitate identification of transformed **plant** cells. Once calius forms, shoot formation can be encouraged by employing the appropriate **plant** hormones in accordance with known methods and the shoots transferred to rooting medium for regeneration of plants. The plants may. . .

DETD Transgenic plants can be used to provide **plant** parts according to the invention for regeneration or tissue culture of cells or tissues containing the constructs described herein. **Plant** parts for these purposes can include leaves, stems, roots, flowers, tissues, epicotyl, meristems, hypocotyls, cotyledons, pollen, ovaries, cells, and protoplasts, or any other portion of the **plant** which can be used to regenerate additional transgenic plants, cells, protoplasts or tissue culture.

DETD . . . disease resistance, repel damaging insects or sustain herbicides. Increases in productivity can also result from improving the adaptability of the **plant** to other unfavorable environmental conditions. Further increases can be achieved by combinations of these traits, through the use of molecular. . .

DETD . . . both direct and indirect, have resulted in the inhibition of photosynthesis. These studies are reviewed by Furbank and Taylor (1995) **Plant** Cell 7:797 and Stitt and Sonnewald (1995) Ann. Rev. **Plant** Physiol. **Plant** Mol. Biol. 46:341. The methods used primarily involved reduction, via antisense transgenes, of enzymes involved in photosynthetically-related processes. Ko et. . .

DETD . . . involved suggests that variations in molecular relationships between different light harvesting complexes/proteins is one of the key mechanisms of the **plant**'s adaptability to changing light

conditions. For instance, a possible reorganizational event to cause adaptation to low lighting conditions could simply. . . . antennae size
or surface area. Larger antennae would capture more light for conversion
to chemical energy. Therefore enhancement of the **plant**'s flexibility to reorganize the light harvesting machinery in response to varying light conditions can benefit the **plant**. Or, as already described, the proportion and/or quantity of pigments can result from the choice of pigment-binding protein incorporated.

DETD . . . interrelated activities and processes, giving rise to changes to productivity and yield and improvements in the marketability and value of **plant** and other products from crop plants. For instance, genetic modifications aimed at enhancing photosynthesis are especially important in situations where. . . e.g., limiting light conditions. Enhancing photosynthesis and related activities can also have a significant impact on crops engineered to produce non-**plant** products, e.g., health products, by providing the energy to drive the production of such products. The implications of this type.
. .

DETD . . . such changes have been shown to occur in response to temperature as well (Huner, N. et al. (1998) Trends in **Plant** Science 3(6):224-230; Gray, G. R. et al. (1998) Photosynthesis Research 56:209-221).

DETD For example, the whole **plant** containing this construct is more stabilized under periods of stress due to improved sensing of environmental changes. Thus, methods of the invention provide plants wherein expression of the DNA construct in a transgenic **plant** when compared to a wild-type **plant** under the same conditions, causes the transgenic **plant** to exhibit at least one phenotypic characteristic in the transgenic **plant** selected from the group consisting of: increased shade tolerance, increased tolerance to high light intensity, enhanced photosynthesis, decreased photoinhibition, increased. . .

DETD . . . enhanced, the technology provided by this invention is most likely to be beneficial and applicable to all photosynthetic organisms and **plant** varieties. In addition to the advancement of knowledge of photosynthesis and related activities, there are four principal categories of benefits. . .

DETD 1) Improved marketability of **plant** products (e.g., greener plants);

DETD The development of technologies for the transfer of genes into **plant** cells and regeneration of intact and fertile plants from the transformed cells provides methods to modify certain of these molecular parameters to provide flexibility for the enhancement of a **plant**'s photosynthetic capacity in low light. Overproduction and elevation of functional Cab proteins of the light harvesting antennae of
photosystem II enable a **plant** to reorganize and harvest more light for photosynthesis. Modifications which cause a positive effect on
photosynthesis can give rise to. . . with their normal unaltered counterparts. Advantageous traits can also be introduced through traditional breeding strategies to provide any desirable recombinant **plant** lines, e.g., elite lines, with the beneficial novel traits in addition to established desirable agronomically important phenotypes.

DETD . . . covers, flowers, vegetables, trees and shrubs. Further, elevated chlorophyll levels will produce post-harvest color retention for fresh produce or dried **plant** products. Increased pigments levels of carotenoids and phycobiliproteins can also have commercial value for the same purposes. Further, increased levels. . .

DETD Further, the constructs and methods of this invention can be used to enhance stem girth, thereby enhancing support of a **plant**. This is especially valuable for fruit bearing crops such as tomatoes, pears,

apples, oranges, lemons, and the like. Larger and. . .

DETD The growth benefits afforded to transgenic plants and plant cells of this invention can be reproduced by incorporating the constructs of this invention into single-celled photosynthetic organisms and plant tissue culture. Thus, more rapid production of plant products which are not easily synthesized, such as taxol and other cell wall products, which are produced in slow-growing plants. . . tissue culture, can be realized. Further, increased photosynthesis and the subsequent increase in growth under low light intensities means that plant regeneration can be accelerated and illumination can be reduced for tissue culture and plant production.

DETD . . . by the constructs of this invention can be used to enhance a number of biochemical and metabolic pathways in the plant. Changes in photosynthesis-related activities can lead to changes in other pathways such as sink-source relationships, metabolic loading and flow. Changes to various metabolites and energy pools will have an effect on the plant's nutritional status and its signaling capabilites. Combining this construct, as an "enhanced energy production source", in plants manipulated (e.g., by. . . overcome if photosynthesis is enhanced during this period. Reduction of mid-day depression of photosynthesis can enhance the productivity of a plant due to its cumulative benefit over a growing season. Enhanced photosynthesis can also lead to higher regeneration capabilities, overwintering and. . .

DETD The DNA construct provided by this invention can also be used as a plant transformation marker, based on differences in coloration, shade/low light responses and faster growth and/or development, especially under low light conditions. The use of naturally-occurring plant DNA sequences allows the detection of integration of exogenous DNA constructs in photosynthetic cells and organisms without the regulatory problems associated with foreign selectable markers. In particular, there is provided a method for detecting transformation in plants, plant tissue or a photosynthetic organism consisting of: preparing a DNA construct comprising a promoter region, a 5' untranslated region containing a translational enhancer, a plastid-specific transit peptide, a gene encoding a plastid protein the. . . a 3' untranslated region containing a functional polyadenylation signal; inserting the DNA construct into a cloning vector; and transforming a plant, tissue culture or photosynthetic organism with the cloning vector so that the protein is expressed, wherein expression of the protein. . .

DETD . . . purposes of identification. Such a characteristic phenotype (e.g., greener cells) allows the identification of protoplasts, cells, cell groups, tissues, organs, plant parts or whole plants containing the constructs. Green pigmentation in cells can be easily measured and screened by using techniques. . . gene typically comprises a desirable phenotype which is not readily identifiable in transformed cells, but which is present when the plant cell or derivative thereof is grown to maturity, even under conditions wherein the selectable marker phenotype itself is not apparent.

DETD Transgenic plant identification and selection can be determined by differences in fluorescence properties and by fluorescence fingerprinting of the photosynthetic complexes. Introduction. . .

DETD . . . the Rbcs 5' untranslated region (5'UTR) and the Rbcs transit peptide confer higher levels of translation and importation, respectively, of chimeric gene constructs. These in vitro import assay and translation data are summarized in Table 2. In many cases, the Rbcs. . .

DETD The templates were transcribed in vitro using the appropriate RNA polymerase corresponding to the promoter type according to

Melton et al. (1984) Nucl. Acids Res. 12:7035. An unmethylated cap analog (GpppG), usually at a concentration. . .

DETD . . . ml of 1.ti[redacted]. HS and an aliquot subjected t[redacted]chlorophyll analysis. Chlorophyll assays were performed as described by Amon (1949) **Plant** Physiol. 24:1. Samples were extracted with 80% (v/v) acetone/20% water. Insoluble material was removed by centrifugation in a microfuge for. . .

DETD TABLE 2

Summary of in vitro import and translation results for various constructs.

A) Plants

Promoter	Translational Enhancer	Transit Signal	Passenger	Phenotype	Protein Level	Comments
35SCaMV	Rbcs.sup.1	Rbcs	Cab.sup.2	+	>Cab	Enhanced low light photosynthesis
35SCaMV	Cab	Cab	Cab	0	=Cab	Normal photosynthesis

B) Test tube studies

Promoter	Translational Enhancer	Transit Signal	Passenger	Translation	Import Level	Comments
--	Rbcs	Rbcs	Rbcs	high	high	normal for Rbcs
--	Rbcs	Rbcs	Cab	high	high	50%. . . Pka
--	Pkg	Pkg	Pkg	moderate	good	normal levels for Pka
--	Pkg	Pkg	Rbcs	moderate	good	resembles Pkg

levels.sup.1 pea
.sup.2 pea
.sup.3 **Arabidopsis** thaliana
.sup.4 Brassica napus
.sup.5 Spinacea oleracea (spinach)
.sup.6 Vicia faba
.sup.7 mouse
.sup.8 Ricinus cummunis (castor)
.sup.9 Nicotiana tabacum (tobacco)

DETD . . . within SEQ ID NO:3 (nucleotides 1 to 29). Expression of the gene construct was facilitated by the strong CaMV 35S **promoter** (Odell, J. T. et al. (1985) Nature 313:810) and transcriptional termination signals originated from the pea Cab gene (A. R.. . .

DETD . . . GAG AAG TCT . . .

R V K C M D P V E K S

Rbcs .rarw. .fwdarw. Cab

Promoter:
35S CaMV
Terminator:
Cab termination sequences (Cashmore (1984) Proc. Nat. Acad. Sci. USA 81:2960-2964)
Binary vector:
EcoRI-PvuII CAMV-Rbcs-Cab into BamHI/blunt end site of pEND4K (kanamycin resistance)

Klee. . .

DETD The Rbcs-Cab **chimeric** gene was fused to the 35S CaMV constitutive **promoter** by inserting a gel-purified EcoRI-HindIII fragment carrying the 35S CaMV **promoter** from plasmid pCAMV (A. R. Cashmore, Univ. Pennsylvania, Philadelphia, Pa.) into the EcoRI-Asp718 sites of pRBCS-CAB (FIG. 4). The corresponding.

.

DETD . . . and in Sambrook et al. 1989, supra. One of the Agrobacterium selected colonies containing an intact pEND4K-CAMV-Rbcs-Cab was used for **plant** transformation.

DETD . . . blotting on sterile filter paper and the discs transferred to petri dishes containing "shoot medium" (Horsch et al. (1988) in **Plant** Molecular Biology Manual, (Eds. S. B. Gelvin, R. A. Schilperoort) Kluwer Acad. Publishers, A5:1-9). Petri plates were sealed

with parafilm. . .

DETD . . . the presence of kanamycin and were verified to possess high levels of NptII activity (McDonnell, R. E. et al. (19[redacted] **Plant** Mol. Biol. Rep. 5:380) were transferred to soil. Selected transformants were selfed and seeds collected. T1 seeds from seven transgenic. . .

DETD The same construct has been introduced into two cultivars of **Arabidopsis**, three cultivars of Brassica, tomato, lettuce and alfalfa. All of these species demonstrate increased growth in culture compared to their. . . This is evident at 65 .mu.moles/meter.sup.2 /sec of illumination in tobacco and lettuce, and 5 .mu.mole/meter.sup.2 /sec of illumination for **Arabidopsis**.

DETD . . . exhibiting high levels of NptII activity. Plants 7-12 represent plants that have been transformed with a control pea Cab construct. **Plant** 13 represents a wild-type nontransformed tobacco **plant** (Nicotiana tabacum cv. Petit Havana SRI). Transcript levels detected by the pea Cab DNA probe were normalized and quantitated by. . .

DETD . . . area of the leaf blade. Leaf pieces were fixed in FAA50 and examined using a light microscope (D. A. Johansen, **Plant** Microtechnique, (McGraw-Hill Book Co., New York, 1940)).

DETD . . . chloroplast is lower than in the cytosol, typically calculated to be between 1.5 and 3.0 (Stitt, M. et al. (1982) **Plant** Physiol. 70:971; Giersch, C. et al. (1980) Biochim. Biophys. Acta 590:59; Neuhaus, N. E. and Stitt, M. (1989) Planta 179:51).. . .

DETD . . . starch synthesis, and ratios of 3-5 indicating a cytoplasmic location with sucrose synthesis being dominant (Gerhardt, R. et al. (1987) **Plant** Physiol. 83:399). Thus, the low G6P/F6P values for both WT and TR plants grown in low light indicate that the. . .

DETD . . . 50 .mu.mol .multidot. m.sup.-2 .multidot. s.sup.-1 lighting.

Metabolite Ratio

Plant type	CER (mol/mol) (.mu.mol .multidot. m.sup.-2 .multidot. s.sup.-1)	Metabolite Content (nmol .multidot. mg.sup.-1 Ch1.) PGA	TP	ATP	ADP	G6P	F6P	G1P	TP	ADP	F6P	PGA/ G6P	ATP/ G6P
100 .mu.mol .multidot. m.sup.-2 .multidot. s.sup.-1													
Wild-type	1.7. . .												

metabolites were determined using a Hitachi U-3300 (Tokyo, Japan) spectrophotometer (Labate, C. A. and R. C. Leegood, R. C. (1989) **Plant** # Physiol. 91:905; Lowry, O. H. and Pasonneau, J. V. (1972) A flexible system of enzymatic analysis (Academic Press, New York).

DETD TABLE 5

Carbohydrate content in young and fully developed leaves

Plant Type	Starch (.mu.mol hexoses equivalents .multidot. mg-1Ch1	Sucrose	Total Carbohydrate

(A) Starch and sucrose content in young leaves. The data are averages of 4 plants .+-.. . . amyloglucosidase (14 units ml-1) cocktail. After centrifugation, the supernatants were assayed for glucose (Jones, M. G. K. et al. (1977) **Plant** Physiol. 60:379).

DETD . . . show that elevating type I LhcIIb Cab protein levels by genetic manipulation results in measurable and significant changes to a **plant**. LhcII is believed to play a key role in controlling the proportion of absorbed excitation energy directed to PSII. Normally,. . .

DETD . . . can be influenced by complicated interactions between light intensity, temperature and the photosynthetic apparatus (Huner et al. (1998) Trends in **Plant** Science 3:224-230), measurements were conducted to determine if manipulations to the photosynthetic apparatus by the said construct resulted in changes to the excitation pressure of

the engineered **plant**. Effects on redox poise were examined for transgenic lettuce according to the method of Huner et al. (1996) Physiol. **Plant** 98:358[illegible]64. A lower excitation pressure[illegible] relative to the wild type untransformed plants, was observed at 5.degree. C. with moderate lighting. . . lower excitation pressure level than wild type. A lower excitation pressure status could be beneficial and less stressful to a **plant**, especially in natural settings where light and temperature fluctuate together constantly on an hourly or daily basis. These types of. . .

DETD . . . via carbon partitioning (export) studies on transgenic Bella Green lettuce plants in low light conditions (100 .mu.moles/m.sup.2 /sec). Similar whole **plant** net carbon exchange rates (i.e., photosynthesis rates) for a leaf area index (LAI) of 3.2 were obtained with 62-day-old wild. . . wild type counterpart in terms of growth rate. The average fresh weight of the transgenic plants was 50 g per **plant** versus 44 g per **plant** for the untransformed wild type. Carbon partitioning studies with the same transgenic and wild type lettuce plants indicated a higher. . .

DETD Canola plants (Brassica napus cv. `Quantum`) were transformed according to the method of Maloney et al. (**Plant** Cell Reporter 8:238-242 (1989)). Northern blotting was performed with 10 .mu.g of total RNA, which was transferred onto Hybond N.sup.+. . .

DETD . . . in 8" pots in a greenhouse in a random block design. At weekly intervals, leaf number, total leaf area and **plant** height were measured. At maturity, **plant** height, height below first mature seed pod, number of main branches, total seed yield per **plant** (in grams), weight of 50 seeds, weight of full pods, weight of empty pods, and length of 30 pods. Ten. . . grown in a growth chamber in 6" pots in a random block design under low light conditions (100 .mu.moles/meter.sup.2 /second). **Plant** height, leaf area, and leaf number were then measured.

DETD . . . Relative to control plants, line 20 exhibited 22% lower total leaf area, 42% lower total leaf number, yet 12% greater **plant** height at maturity. The first mature seed pods were formed higher on the stem on the transgenic plants, and the. . .

DETD . . . taller at maturity (FIG. 14A), had a longer average pod length (FIG. 14B), an increase in total seed yield per **plant** (in grams, FIG. 14C), and the average seed size (in grams) was greater (FIG. 14D).

CLM What is claimed is:

1. A method for modulating the biomass of a **plant** or photosynthetic organism comprising incorporating into the organism, a DNA construct comprising: a) a **promoter**; b) a 5' untranslated region containing a translational enhancer; c) DNA encoding a heterologous plastid-specific transit peptide which enhances protein.

.

3. The method according to claim 1, wherein the **promoter** is a constitutive **promoter**.

4. The method according to claim 3, wherein the constitutive **promoter** is a 35S cauliflower mosaic virus (CaMV) **promoter**.

14. The method according to claim 1, wherein expression of the DNA construct in a transgenic **plant**, when compared to a wild-type **plant** under the same conditions, is manifested by at least one phenotypic characteristic in the transgenic **plant** selected from the group consisting of: increased shade tolerance, increased tolerance to high light intensity, enhanced photosynthesis, decreased photoinhibition, increased. . .

15. A method for modulating the distribution and/or content of pigments

in a **plant**, tissue culture or photosynthetic organism comprising transforming a **plant**, tissue culture or photosynthetic organism with a DNA construct comprising a **promoter**, a 5' untranslated region containing a translational enhancer, DNA encoding a heterologous plastid-specific transit peptide which enhances protein import, a. . . polyadenylation signal, wherein expression of the plastid membrane protein causes a different distribution and/or quantity of pigments compared an untransformed **plant**, tissue culture or photosynthetic organism of the same species under the same environmental conditions.

16. The method of claim 15 wherein modulation of the distribution and/or content of pigments in a **plant** or photosynthetic organism, in comparison to wild-type plants under the same environmental conditions, is manifested by one or more of. . . . increasing the redox potential of a cell, the method comprising incorporating into the cell a DNA construct comprising a) a **promoter**; b) a 5' untranslated region containing a translational enhancer; c) DNA encoding a heterologous plastid-specific transit peptide which enhances protein. . .

18. A method for increasing the ability of a **plant** to withstand a stress, the method comprising incorporating into one or more cells of the **plant** a DNA construct comprising a) a **promoter**; b) a 5' untranslated region containing a translational enhancer; c) DNA encoding a heterologous plastid-specific transit peptide which enhances protein. . . a 3' untranslated region containing a functional polyadenylation signal wherein expression of the DNA construct increases the ability of the **plant** to withstand the stress.

21. The method according to claim 20, wherein expression of the DNA construct in a transgenic **plant**, when compared to a wild-type **plant** under the same conditions, causes an increase in size of seeds or an increase in number of seeds of the transgenic **plant** .

=> d history

(FILE 'HOME' ENTERED AT 17:49:00 ON 13 DEC 2001)

FILE 'MEDLINE, CAPLUS, LIFESCI, EMBASE, USPATFULL' ENTERED AT 17:49:30 ON 13 DEC 2001

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L1        21683 S (ERECTILE AND DYSFUNCTION) OR IMPOTENCE
L2          148 S L1 AND ENDOTHELIN
L3           21 S L2 AND APOMORPHINE
L4           19 DUP REM L3 (2 DUPLICATES REMOVED)
L5        26622 S PLANT AND PROMOTER
L6            0 S L5 AND FERRODOXIN? AND ROLD
L7         6479 S L5 AND (CHIMERIC OR CHIMAERIC)
L8         3629 S L7 AND (COMPLEMENTARY)
L9            0 S L7 AND (COMPLEMENTARY PATTERN)
L10        2154 S L7 AND MINIMAL
L11           0 S L7 AND (MINIMAL SAME PROMOTER)
L12        1222 S L7 AND ARABIDOPSIS
L13          10 S L12 AND (FERRODOXIN OR FERRODOXINE)
L14          10 DUP REM L13 (0 DUPLICATES REMOVED)
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=> b medline caplus lifesci embase uspatfull biosis

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COST IN U.S. DOLLARS                        SINCE FILE      TOTAL
                                              ENTRY      SESSION
FULL ESTIMATED COST                          116.07      116.22

FILE 'MEDLINE' ENTERED AT 18:46:44 ON 13 DEC 2001

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FILE 'BIOSIS' ENTERED AT 18:46:44 ON 13 DEC 2001
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=> s palnt and promoter

L15           0 PALNT AND PROMOTER

=> s plant and promoter

L16       30140 PLANT AND PROMOTER

=> s l16 and ferrodoxin? and Rold

L17           0 L16 AND FERRODOXIN? AND ROLD

=> s l16 and (ferrodoxin or ferrodoxine)

L18          15 L16 AND (FERRODOXIN OR FERRODOXINE)

=> s l18 and chimeric or chimaeric

L19        3838 L18 AND CHIMERIC OR CHIMAERIC

=> s l18 and (chimeric or chimaeric)

L20          14 L18 AND (CHIMERIC OR CHIMAERIC)

=> dup rem l20

PROCESSING COMPLETED FOR L20
L21           14 DUP REM L20 (0 DUPLICATES REMOVED)

=> d history


     (FILE 'HOME' ENTERED AT 17:49:00 ON 13 DEC 2001)

     FILE 'MEDLINE, CAPLUS, LIFESCI, EMBASE, USPATFULL' ENTERED AT 17:49:30
ON
     13 DEC 2001
L1         21683 S (ERECTILE AND DYSFUNCTION) OR IMPOTENCE
L2           148 S L1 AND ENDOTHELIN
L3            21 S L2 AND APOMORPHINE
L4            19 DUP REM L3 (2 DUPLICATES REMOVED)
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L5        26622 S PLANT AND PROMOTER
L6            0 S L5 AND FERRODOXIN? AND ROLD
L7         6479 S L5 AND (CHIMERIC OR CHIMAERIC)
L8         3629 S L7 AND (COMPLEMENTARY)
L9            0 S L7 AND (COMPLEMENTARY PATTERN)
L10        2154 S L7 AND MINIMAL
L11           0 S L7 AND (MINIMAL SAME PROMOTER)
L12        1222 S L7 AND ARABIDOPSIS
L13          10 S L12 AND (FERRODOXIN OR FERRODOXINE)
L14          10 DUP REM L13 (0 DUPLICATES REMOVED)

     FILE 'MEDLINE, CAPLUS, LIFESCI, EMBASE, USPATFULL, BIOSIS' ENTERED AT
     18:46:44 ON 13 DEC 2001
L15           0 S PALNT AND PROMOTER
L16       30140 S PLANT AND PROMOTER
L17           0 S L16 AND FERRODOXIN? AND ROLD
L18          15 S L16 AND (FERRODOXIN OR FERRODOXINE)
L19        3838 S L18 AND CHIMERIC OR CHIMAERIC
L20          14 S L18 AND (CHIMERIC OR CHIMAERIC)
L21          14 DUP REM L20 (0 DUPLICATES REMOVED)

=> s l21 not l13

L22           4 L21 NOT L13

=> d l22 ibib abs tot


L22  ANSWER 1 OF 4  CAPLUS  COPYRIGHT 2001 ACS
ACCESSION NUMBER:         1990:1903  CAPLUS
DOCUMENT NUMBER:          112:1903
TITLE:                    cis-Acting elements for light regulation of pea
                          ferredoxin I gene expression are located within
                          transcribed sequences
AUTHOR(S):                Elliott, Robert C.; Dickey, Lynn F.; White, Michael
                          J.; Thompson, William F.
CORPORATE SOURCE:         Dep. Bot., North Carolina State Univ., Raleigh, NC,
                          27695, USA
SOURCE:                   Plant Cell (1989), 1(7), 691-8
                          CODEN: PLCEEW; ISSN: 1040-4651
DOCUMENT TYPE:            Journal
LANGUAGE:                 English
AB   An intact pea gene encoding ferredoxin I (Fed-1) and several
     chimeric constructs contg. portions of Fed-1 were introduced into
     tobacco plants by Agrobacterium-mediated transformation.  The intact gene
     was correctly transcribed and translated to produce a protein that was
     imported into the chloroplast and processed to its mature size.  Fed-1
     mRNA accumulation in these plants was strongly light-dependent, as it is
     in pea leaves.  In chimeric constructs, the Fed-1
     promoter was active but no light responses were seen, even when as
     much as 2 kilobases of 5'-flanking sequence were incuded.  There were no
     clear light responses with a construct contg. 3'-flanking sequences from
     Fed-1 attached to a .beta.-glucuronidase gene driven by the cauliflower
     mosaic virus 35S promoter.  However, the transcribed portion of
     Fed-1 conveyed normal light responsiveness when driven by the 35S
     promoter.  The results are discussed in terms of the hypothesis
     that light dets. Fed-1 mRNA abundance by affecting RNA stability rather
     than by affecting transcription.

L22  ANSWER 2 OF 4  USPATFULL
ACCESSION NUMBER:         2000:142155  USPATFULL
TITLE:                    Genes encoding denitrification reactions
INVENTOR(S):              Bedzyk, Laura Anne, Odessa, DE, United States
                          Ye, Rick Weizhang, Hockessin, DE, United States
PATENT ASSIGNEE(S):       E. I. du Pont de Nemours & Company, Wilmington, DE,
                          United States (U.S. corporation)
```

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 6136588		20001024
APPLICATION INFO.:	US 1999-354129		19990715 (9)

	NUMBER	DATE
PRIORITY INFORMATION:	US 1998-93191	19980717 (60)

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Prouty, Rebecca E.
ASSISTANT EXAMINER: Hutson, Richard
NUMBER OF CLAIMS: 7
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 1 Drawing Figure(s); 1 Drawing Page(s)
LINE COUNT: 1740
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB This invention relates to the isolation of nucleic acid fragments from Pseudomonas sp. strain G-179 that encode periplasmic nitrate reductase and nitric oxide reductase enzymes. The enzymes are useful in denitrification reactions and for the identification of other denitrifying bacteria. In addition, this invention also relates to the construction of **chimeric** genes encoding all or a substantial portion of a bacterial nitric oxide reductase or a bacterial periplasmic nitrate reductase enzymes, in sense or antisense orientation, wherein the expression of the **chimeric** genes results in production of altered levels of the nitric oxide reductase or periplasmic nitrate reductase in a transformed host cell.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L22 ANSWER 3 OF 4 USPATFULL
ACCESSION NUMBER: 2000:128276 USPATFULL
TITLE: Herbicidal compositions and processes based on **ferrodoxin**:NADP reductase inhibitors
INVENTOR(S): Wagner, Oliver, Ludwigshafen, Germany, Federal Republic of
Rohl, Franz, Schifferstadt, Germany, Federal Republic of
Grossmann, Klaus, Neuhofen, Germany, Federal Republic of
Schmidt, Ralf-Michael, Kirrweiler, Germany, Federal Republic of
Sonnewald, Uwe, Quedlinburg, Germany, Federal Republic of
Hajirezaei, Mohammad, Gatersleben, Germany, Federal Republic of
PATENT ASSIGNEE(S): BASF Aktiengesellschaft, Ludwigshafen, Germany, Federal Republic of (non-U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 6124242		20000926
APPLICATION INFO.:	US 1999-336731		19990621 (9)

	NUMBER	DATE
PRIORITY INFORMATION:	DE 1998-19828509	19980626

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Powers, Fiona T.
LEGAL REPRESENTATIVE: Keil & Weinkauf

NUMBER OF CLAIMS: 3
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 2 D[redacted]ing Figure(s); 2 Drawing Page([redacted]
LINE COUNT: 792
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB There are described ferredoxin:NADP reductase inhibitors, an assay system for the search for such inhibitors, and their use as herbicides.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L22 ANSWER 4 OF 4 USPATFULL
ACCESSION NUMBER: 97:29642 USPATFULL
TITLE: Enhanced carotenoid accumulation in storage organs of genetically engineered plants
INVENTOR(S): Hauptmann, Randal, Woodland, CA, United States
Eschenfeldt, William H., St. Charles, IL, United States
English, Jami, Aurora, IL, United States
Brinkhaus, Friedhelm L., Lisle, IL, United States
PATENT ASSIGNEE(S): Amoco Corporation, Chicago, IL, United States (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 5618988		19970408
APPLICATION INFO.:	US 1994-331004		19941028 (8)

RELATED APPLN. INFO.: Continuation-in-part of Ser. No. US 1991-805061, filed on 9 Dec 1991, now abandoned And Ser. No. US 1993-93577, filed on 19 Jul 1993 which is a continuation of Ser. No. US 1991-785569, filed on 30 Oct 1991, now abandoned And a continuation-in-part of Ser. No. US 1993-96043, filed on 22 Jul 1993, now patented, Pat. No. US 5530189 which is a continuation of Ser. No. US 1991-785568, filed on 30 Oct 1991, now abandoned And a continuation-in-part of Ser. No. US 1993-95726, filed on 21 Jul 1993, now patented, Pat. No. US 5530188 which is a continuation of Ser. No. US 1991-785566, filed on 30 Oct 1991, now abandoned And a continuation-in-part of Ser. No. US 1993-96623, filed on 22 Jul 1993, now abandoned which is a continuation of Ser. No. US -805061 which is a continuation-in-part of Ser. No. US 1990-562674, filed on 3 Aug 1990, now abandoned Ser. No. Ser. No. US -785569 Ser. No. Ser. No. US -785568 Ser. No. Ser. No. US -785566 And Ser. No. US 1991-662921, filed on 28 Feb 1991, now abandoned , said Ser. No. US 1990-562674, filed on 30 Aug 1990 which is a continuation-in-part of Ser. No. US 1990-562551, filed on 18 May 1990, now abandoned which is a continuation-in-part of Ser. No. US 1990-487613, filed on 2 Mar 1990, now abandoned
DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Chereskin, Che S.
LEGAL REPRESENTATIVE: Amoco Corporation
NUMBER OF CLAIMS: 38
EXEMPLARY CLAIM: 27
NUMBER OF DRAWINGS: 13 Drawing Figure(s); 13 Drawing Page(s)
LINE COUNT: 2442
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB A transgenic higher **plant**, seed containing the transgene, and methods of providing enhanced carotenoid accumulation are disclosed. The transgenic higher **plant** has a genomic structural gene that encodes a **chimeric** polypeptide conjugate and over accumulates a colored native carotenoid in a preselected storage organ relative to

the accumulation in a non-transgenic **plant** of the same type. Expression of the **chimeric** polypeptide is driven by a **promoter** operatively linked to that structural gene that provides storage organ-enhanced expression. The **chimeric** polypeptide has an N-terminal plastid transit peptide portion whose C-terminus is linked to the N-terminus of a non-higher **plant** phytoene synthase enzyme.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

=> s (Chimeric or chimaeric) same promoter

MISSING OPERATOR HIMAERIC) SAME
The search profile that was entered contains terms or
nested terms that are not separated by a logical operator.

=> s (Chimeric or chimaeric)same promoter

MISSING OPERATOR CHIMAERIC)SAME
The search profile that was entered contains terms or
nested terms that are not separated by a logical operator.

=> s (chimeric or chimaeric)

L23 99999 (CHIMERIC OR CHIMAERIC)

=> s (Chimeric or chimaeric) (p) promoter

L24 13246 (CHIMERIC OR CHIMAERIC) (P) PROMOTER

=> s (Chimeric or chimaeric) (5n) promoter

L25 3488 (CHIMERIC OR CHIMAERIC) (5N) PROMOTER

=> s l25 and plant

L26 1476 L25 AND PLANT

=> d history

(FILE 'HOME' ENTERED AT 17:49:00 ON 13 DEC 2001)

FILE 'MEDLINE, CAPLUS, LIFESCI, EMBASE, USPATFULL' ENTERED AT 17:49:30 ON
13 DEC 2001
L1 21683 S (ERECTILE AND DYSFUNCTION) OR IMPOTENCE
L2 148 S L1 AND ENDOTHELIN
L3 21 S L2 AND APOMORPHINE
L4 19 DUP REM L3 (2 DUPLICATES REMOVED)
L5 26622 S PLANT AND PROMOTER
L6 0 S L5 AND FERRODOXIN? AND ROLD
L7 6479 S L5 AND (CHIMERIC OR CHIMAERIC)
L8 3629 S L7 AND (COMPLEMENTARY)
L9 0 S L7 AND (COMPLEMENTARY PATTERN)
L10 2154 S L7 AND MINIMAL
L11 0 S L7 AND (MINIMAL SAME PROMOTER)
L12 1222 S L7 AND ARABIDOPSIS
L13 10 S L12 AND (FERRODOXIN OR FERRODOXINE)
L14 10 DUP REM L13 (0 DUPLICATES REMOVED)

FILE 'MEDLINE, CAPLUS, LIFESCI, EMBASE, USPATFULL, BIOSIS' ENTERED AT 18:46:44 ON 13 DEC 2001
L15 0 S PALNT AND PROMOTER
L16 30140 S PLANT AND PROMOTER

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L17           0 S L16 AND FERRODOXIN? AND ROLD
L18          15 S L16 AND (FERRODOXIN OR FERRODOXINE)
L19        3838 S L18 AND [redacted]MERIC OR CHIMAERIC
L20          14 S L18 AND (CHIMERIC OR CHIMAERIC)
L21          14 DUP REM L20 (0 DUPLICATES REMOVED)
L22           4 S L21 NOT L13
L23       99999 S (CHIMERIC OR CHIMAERIC)
L24       13246 S (CHIMERIC OR CHIMAERIC) (P) PROMOTER
L25        3488 S (CHIMERIC OR CHIMAERIC) (5N) PROMOTER
L26        1476 S L25 AND PLANT

=> s l26 and ferrodoxin?

L27           4 L26 AND FERRODOXIN?

=> dup rem l27

PROCESSING COMPLETED FOR L27
L28           4 DUP REM L27 (0 DUPLICATES REMOVED)

=> d l28 ibib abs tot


L28  ANSWER 1 OF 4  USPATFULL
ACCESSION NUMBER:        2001:79356  USPATFULL
TITLE:                   Constructs and methods for enhancing protein levels in
                         photosynthetic organisms
INVENTOR(S):             Ko, Kenton, Kingston, Canada
                         Ko, Zdenka W., Kingston, Canada
                         Labate, Carlos A., Sao Paolo, Brazil
                         Granell, Antonio, Valencia, Spain
PATENT ASSIGNEE(S):      Queen's University at Kingston, Kingston, Canada
                         (non-U.S. corporation)

                              NUMBER         KIND    DATE
                         ---------------- ------ --------
PATENT INFORMATION:      US 6239332          B1   20010529
APPLICATION INFO.:       US 1999-328153           19990608  (9)
RELATED APPLN. INFO.:    Continuation-in-part of Ser. No. US 1996-759463, filed
                         on 5 Dec 1996 Continuation-in-part of Ser. No. US
                         568168, now abandoned
DOCUMENT TYPE:           Utility
FILE SEGMENT:            Granted
PRIMARY EXAMINER:        Benzion, Gary
LEGAL REPRESENTATIVE:    Pearlmutter, Nina L., Steeg, Carol Miernicki,
Scribner,
                         Stephen J.
NUMBER OF CLAIMS:        21
EXEMPLARY CLAIM:         1
NUMBER OF DRAWINGS:      30 Drawing Figure(s); 18 Drawing Page(s)
LINE COUNT:              2398
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB     This invention provides novel gene constructs which enhance the
       efficiency of plant cells and cells of other photosynthetic
       organisms. Also provided are transgenic plants and seeds which
       overexpress proteins. Methods to elevate the amount of plastid proteins
       in plants and photosynthetic organisms are exemplified.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L28  ANSWER 2 OF 4  USPATFULL
ACCESSION NUMBER:        2000:2040  USPATFULL
TITLE:                   Constructs and methods for enhancing protein levels in
                         photosynthetic organisms
INVENTOR(S):             Ko, Kenton, Kingston, Canada
                         Ko, Zdenka W., Kingston, Canada
```

Labate, Carlos A., Piracicaba, Brazil
Granell, Antonio, Alginet, Spain
PATENT ASSIGNEE(S): Queen's University at Kingston, Kingston, Canada (non-U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 6011198		20000104
APPLICATION INFO.:	US 1996-759463		19961205 (8)

RELATED APPLN. INFO.: Continuation-in-part of Ser. No. US 1995-568168, filed on 6 Dec 1995
DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Robinson, Douglas W.
ASSISTANT EXAMINER: Haas, Thomas
LEGAL REPRESENTATIVE: Hamilton, Brook, Smith & Reynolds, P.C.
NUMBER OF CLAIMS: 40
EXEMPLARY CLAIM: 23
NUMBER OF DRAWINGS: 26 Drawing Figure(s); 16 Drawing Page(s)
LINE COUNT: 2206
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB This invention provides novel gene constructs which enhance the efficiency of **plant** cells and cells of other photosynthetic organisms. Also provided are transgenic plants and seeds which overexpress proteins. Methods to elevate the amount of plastid proteins in plants and photosynthetic organisms are exemplified.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L28 ANSWER 3 OF 4 USPATFULL
ACCESSION NUMBER: 97:29642 USPATFULL
TITLE: Enhanced carotenoid accumulation in storage organs of genetically engineered plants
INVENTOR(S): Hauptmann, Randal, Woodland, CA, United States
Eschenfeldt, William H., St. Charles, IL, United States
English, Jami, Aurora, IL, United States
Brinkhaus, Friedhelm L., Lisle, IL, United States
PATENT ASSIGNEE(S): Amoco Corporation, Chicago, IL, United States (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 5618988		19970408
APPLICATION INFO.:	US 1994-331004		19941028 (8)

RELATED APPLN. INFO.: Continuation-in-part of Ser. No. US 1991-805061, filed on 9 Dec 1991, now abandoned And Ser. No. US 1993-93577, filed on 19 Jul 1993 which is a continuation of Ser. No. US 1991-785569, filed on 30 Oct 1991, now abandoned And a continuation-in-part of Ser. No. US 1993-96043, filed on 22 Jul 1993, now patented, Pat. No. US 5530189 which is a continuation of Ser. No. US 1991-785568, filed on 30 Oct 1991, now abandoned And a continuation-in-part of Ser. No. US 1993-95726, filed on 21 Jul 1993, now patented, Pat. No. US 5530188 which is a continuation of Ser. No. US 1991-785566, filed on 30 Oct 1991, now abandoned And a continuation-in-part of Ser. No. US 1993-96623, filed on 22 Jul 1993, now abandoned which is a continuation of Ser. No. US -805061 which is a continuation-in-part of Ser. No. US 1990-562674, filed on 3 Aug 1990, now abandoned Ser. No. Ser. No. US -785569 Ser. No. Ser. No. US -785568 Ser. No. Ser. No. US -785566 And Ser. No. US 1991-662921, filed on 28 Feb 1991, now abandoned , said Ser. No. US 1990-562674, filed on 30 Aug 1990 which is a

continuation-in-part of Ser. No. US 1990-562551, filed on 13 May 1990, now abandoned which is a continuation-in-part of Ser. No. US 1990-487613, filed on 2 Mar 1990, now abandoned

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Chereskin, Che S.
LEGAL REPRESENTATIVE: Amoco Corporation
NUMBER OF CLAIMS: 38
EXEMPLARY CLAIM: 27
NUMBER OF DRAWINGS: 13 Drawing Figure(s); 13 Drawing Page(s)
LINE COUNT: 2442
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A transgenic higher **plant**, seed containing the transgene, and methods of providing enhanced carotenoid accumulation are disclosed. The transgenic higher **plant** has a genomic structural gene that encodes a chimeric polypeptide conjugate and over accumulates a colored native carotenoid in a preselected storage organ relative to the accumulation in a non-transgenic **plant** of the same type. Expression of the **chimeric** polypeptide is driven by a **promoter** operatively linked to that structural gene that provides storage organ-enhanced expression. The chimeric polypeptide has an N-terminal plastid transit peptide portion whose C-terminus is linked to the N-terminus of a non-higher **plant** phytoene synthase enzyme.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L28 ANSWER 4 OF 4 CAPLUS COPYRIGHT 2001 ACS
ACCESSION NUMBER: 1990:1903 CAPLUS
DOCUMENT NUMBER: 112:1903
TITLE: cis-Acting elements for light regulation of pea ferredoxin I gene expression are located within transcribed sequences
AUTHOR(S): Elliott, Robert C.; Dickey, Lynn F.; White, Michael J.; Thompson, William F.
CORPORATE SOURCE: Dep. Bot., North Carolina State Univ., Raleigh, NC, 27695, USA
SOURCE: Plant Cell (1989), 1(7), 691-8
CODEN: PLCEEW; ISSN: 1040-4651
DOCUMENT TYPE: Journal
LANGUAGE: English

AB An intact pea gene encoding ferredoxin I (Fed-1) and several chimeric constructs contg. portions of Fed-1 were introduced into tobacco plants by Agrobacterium-mediated transformation. The intact gene was correctly transcribed and translated to produce a protein that was imported into the chloroplast and processed to its mature size. Fed-1 mRNA accumulation in these plants was strongly light-dependent, as it is in pea leaves. In **chimeric** constructs, the Fed-1 **promoter** was active but no light responses were seen, even when as much as 2 kilobases of 5'-flanking sequence were incuded. There were no clear light responses with a construct contg. 3'-flanking sequences from Fed-1 attached to a .beta.-glucuronidase gene driven by the cauliflower mosaic virus 35S promoter. However, the transcribed portion of Fed-1 conveyed normal light responsiveness when driven by the 35S promoter. The results are discussed in terms of the hypothesis that light dets. Fed-1 mRNA abundance by affecting RNA stability rather than by affecting transcription.